The Nutrition Transition

Benjamin Caballero, M.D., Ph.D.
Center for Human Nutrition
Johns Hopkins Bloomberg School of Public Health
Annual increase in obesity rates in selected countries (women)

Popkin and Gordon-Larsen, 2004
Under- and overweight, 0-5 yr/old children

%
Is the world shifting from undernutrition to overnutrition?
Prevalence of stunting in < 5 yr/old children

Prevalence of stunting, %

S Asia
SE Asia
SS Africa
Near E-N Africa
S America

2002 1995 1980

SCC/SCN, UNICEF, 2004
## World poverty, 1981-2001

% of people living with <US$2 per day

<table>
<thead>
<tr>
<th>Region</th>
<th>1981</th>
<th>1990</th>
<th>2001</th>
</tr>
</thead>
<tbody>
<tr>
<td>South Asia</td>
<td>89.1</td>
<td>85.5</td>
<td>77.2</td>
</tr>
<tr>
<td>Sub-Saharan Africa</td>
<td>73.3</td>
<td>75.0</td>
<td>76.6</td>
</tr>
<tr>
<td>South E Asia &amp; Oceania</td>
<td>84.8</td>
<td>69.9</td>
<td>47.4</td>
</tr>
<tr>
<td>Latin American &amp; Caribbean</td>
<td>26.9</td>
<td>28.4</td>
<td>24.5</td>
</tr>
<tr>
<td>North Africa &amp; Middle E</td>
<td>28.9</td>
<td>21.4</td>
<td>23.2</td>
</tr>
<tr>
<td>Europe &amp; Central Asia</td>
<td>4.7</td>
<td>4.9</td>
<td>19.7</td>
</tr>
</tbody>
</table>

World Bank, 2004
The Nutrition Transition

- Demographic trends
- Food availability and cost
- Lifestyle
Demographic trends

- Urbanization
- Increase in life expectancy
- Reduction in infant mortality
World population growth, 1500-2100
Age shifts in world population

Growth rate, %

Year

Zlotnik, UN Population Div.
Population over 59 years

Relative increase, 1950 = 100

- Europe
- N. Amer.
- Asia
- Latin Am.
- Africa

- 1950
- 1985
- 2025
Urban growth
Annual increase, 1990-2000

% increase

Africa | Asia | L.A. | Europe | N.A.

0 | 2 | 3 | 4 | 5
Projected population growth in the developing world, 2000 - 2025

United Nations, 1998
Urbanization and body mass index

INCLEN, 1996
GROWTH OF VENEZUELAN CHILDREN
Weight/age

<table>
<thead>
<tr>
<th>Percentiles</th>
<th>Rural (%)</th>
<th>Urban (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 10th</td>
<td>27.69</td>
<td>17.99</td>
</tr>
<tr>
<td>10th &gt; &lt;90th</td>
<td>67.21</td>
<td>72.93</td>
</tr>
<tr>
<td>&gt; 90th</td>
<td>5.09</td>
<td>9.06</td>
</tr>
</tbody>
</table>

Lopez Blanco et al, 1992
Dietary changes

- Changes in food type, availability and cost
- Changes in eating behaviors
Food commodities - Global trends

FAOSTAT, 2002
Growth in processed food market by GNI 1996-2002

USDA ERS-Euromonitor, 2003 – World Bank country classification
Food cost: household budget share

Country income level

Low (32) 47%
Middle (41) 29%
High (26) 12%

L=<15%, M=15-50%, H=>50% of U.S. median

USDA ERS WRS-01-1
Food cost: income elasticity

<table>
<thead>
<tr>
<th>Country income level</th>
<th>Low (32)</th>
<th>Middle (41)</th>
<th>High (26)</th>
</tr>
</thead>
<tbody>
<tr>
<td>%</td>
<td>73</td>
<td>58</td>
<td>29</td>
</tr>
</tbody>
</table>

L=<15%, M=15-50%, H=>50% of U.S. median

USDA ERS WRS-01-1
China: dietary trends
Consumption of edible oils

- Low
- Middle
- High

income level

g/day

1989
1997
Lifestyle changes

- Reduction in energy demands at work
- Reduction in energy demands of daily survival activities
- Limited leisure physical activity
- Television
Trends in employment type in South Asian transitional countries

Popkin et al, 1998
The nutrition transition in China: Prevalence of sedentary occupational activity

![Bar chart showing the prevalence of sedentary occupational activity in urban and rural areas for men and women.](chart.png)
The added risk of early undernutrition
Birth weight and risk of diabetes and Syndrome X

Phipps et al, 1993
Effects of birthweight and adult BMI on prevalence of the insulin resistance syndrome

The San Antonio Heart Study

Valdez et al, Diabetologia, 1994
China: trends in obesity
Population with BMI > 25

Du et al, SSM 2004
Trends in diabetes in China

Adults

China National Survey, InterAsia Study
China NTP: metabolic syndrome and BMI (urban and rural)

* Significantly higher than 1, p<0.05
Age-adjusted urban-rural differences in lifestyle factors: Energy intake

![Bar chart showing energy intake in kcal/day for urban and rural areas, with separate bars for men and women.]

- **Urban Men**: 2500 kcal/day
- **Urban Women**: 2001 kcal/day
- **Rural Men**: 2600 kcal/day
- **Rural Women**: 2059 kcal/day
Recent trends

- In intermediate-income countries, obesity is increasing more among the poor.
- Obesity prevalence in rural populations is approaching the rates of urban areas.
Difference in prevalence of underweight and obesity, low vs. high SES - Brazil

Monteiro, AJPH 2004
Disease burden in the developing world

1990

- Non-CD: 47%
- CD: 42%
- Inj.: 11%

2020

- Non-CD: 69%
- CD: 42%
- Acc: 14%
- CD: 17%

Murray & Lopez, 1996
The big picture
Mean BMI in 27 yr-old U.S. males

Costa & Fogel, 1997
Trends in BMI in China
Modeling from regional and national data

1960 → 1990

Upper SES

Lower SES
% of men not working on the previous month due to illness (excluding accidents) - Bangladesh

Pryer, Eur J Clin Nutr, 1993
UN Millenium Development Goals

- Eradicate extreme poverty and hunger
- Achieve universal primary education
- Promote gender equality and empower women
- Reduce child mortality
- Improve maternal health
- Combat HIV/AIDS, malaria, and other diseases
- Ensure environmental sustainability
- Develop a global partnership for development